CLAIMS

1. A light modulator for modulating light from a source, said light modulator comprising:

at least one grating disposed to be illuminated by said light from said source, said at least one grating being adapted to be movable among a set of discrete positions, and

a MEMS actuator adapted for moving said at least one grating to a selected position among said set of discrete positions, to direct light of a selected wavelength diffracted by said grating into a selected direction.

2. A spatial light modulator comprising a multiplicity of light modulators according to claim 1.

3. A light source comprising at least one light modulator according to claim 1.

4. A display device comprising a multiplicity of light modulators according to claim 1, arranged in an array.

5. The light modulator of claim 1, wherein said at least one grating comprises at least one grating having a multiplicity of parallel grooves, said grating being adapted to be tilted about an axis parallel to said grooves.

6. The light modulator of claim 5, wherein said at least one grating is adapted to be tilted to a selected angle among a set of discrete angles relative to said light from said source.

7. The light modulator of claim 5, wherein said at least one grating comprises a multiplicity of gratings.

8. A spatial light modulator according to claim 7, wherein said multiplicity of gratings is arranged in an array.

9. The light modulator of claim 1, wherein said at least one grating comprises at least one grating having a multiplicity of parallel grooves, said grating being blazed to diffract said selected wavelength into a selected diffraction order.

10. A spatial light modulator comprising a multiplicity of light modulators according to claim 9, arranged in an array.

11. The light modulator of claim 1, wherein said at least one grating comprises at least one grating having a multiplicity of parallel grooves in a plane, said grating being adapted to be movable substantially parallel to said plane.

12. The light modulator of claim 11, wherein said grating is adapted to be movable by translation along an axis substantially parallel to said plane.

13. The light modulator of claim 11, wherein said at least one grating comprises at least one grating having a multiplicity of parallel grooves, said grating being blazed to diffract said selected wavelength into a selected diffraction order.

14. The light modulator of claim 13, comprising three or more blazed gratings, each blazed for a different wavelength.

15. The light modulator of claim 14, wherein said three or more blazed gratings, are blazed for wavelengths corresponding to red, green, and blue light.

16. A spatial light modulator comprising a multiplicity of light modulators according to claim 13, arranged in an array.

17. A light modulator for modulating light from a source, said light modulator comprising:

one or more blazed gratings disposed to be illuminated by said light from said source, said one or more blazed gratings being disposed substantially parallel to a first plane,

at least one aperture movably disposed in a second plane, and

at least one MEMS actuator adapted to move said at least one aperture substantially parallel to said second plane to selectively direct light diffracted by said one or more blazed gratings through said at least one aperture.

18. The light modulator of claim 17, wherein said MEMS actuator is adapted to move said at least one aperture by translation along an axis substantially parallel to said first plane.

19. The light modulator of claim 17, wherein said MEMS actuator is adapted to move said at least one aperture by translation along an axis substantially parallel to said second plane.

20. The light modulator of claim 17, wherein said MEMS actuator includes a movable portion integral with said at least one aperture.

21. The light modulator of claim 17, wherein said one or more blazed gratings are formed on a substrate and said MEMS actuator includes a fixed portion integral with said substrate.

22. The light modulator of claim 17, wherein said second plane is substantially parallel to and spaced apart from said first plane.

23. The light modulator of claim 17, comprising three or more blazed gratings, each blazed for a different wavelength.

24. The light modulator of claim 23, wherein said three or more blazed gratings, are blazed for wavelengths corresponding to red, green, and blue light.

25. A light modulator for modulating light from a source, said light modulator comprising:

a blazed grating disposed to be illuminated by said light from said source, and

a MEMS thermal actuator adapted for tilting said grating continuously through a range of angles relative to said light from said source, to direct light of a selected wavelength diffracted by said grating into a selected direction.

26. The light modulator of claim 25, wherein the MEMS thermal actuator is adapted for tilting the blazed grating to three or more predetermined discrete angles to selectively direct light of three or more predetermined wavelengths diffracted by the blazed grating into a selected direction.

27. The light modulator of claim 25, wherein the blazed grating is adapted to be tilted about an axis and wherein the MEMS thermal actuator comprises two thermal actuating elements disposed on opposite sides of said axis, each of the

two thermal actuating elements being adapted for tilting the blazed grating about said axis.

28. The light modulator of claim 25, wherein the MEMS thermal actuator comprises a pre-shaped monomorphic thermal actuator.

29. The light modulator of claim 28, wherein the MEMS thermal actuator is formed by the steps of: forming silicon oxide on a region of a silicon substrate, covering the silicon oxide with a layer of polysilicon, and removing the silicon oxide.

30. The light modulator of claim 25, wherein the MEMS thermal actuator comprises a cantilevered thermal lift arm.

31. The light modulator of claim 30, wherein the cantilevered thermal lift arm comprises a plurality of segments, each segment thereof comprising a heater material and two materials having unequal thermal expansion coefficients.

32. A spatial light modulator comprising a multiplicity of light modulators according to claim 25, arranged in an array.

33. A display device comprising a multiplicity of light modulators according to claim 25, arranged in an array.

34. A light modulator for modulating light from a source, said light modulator comprising:

at least one means for diffracting said light from said source, said at least one means for diffracting being disposed to be illuminated by said light from said source and being adapted to be movable among a set of positions, and

microelectromechanical means for actuating, adapted for moving said at least one means for diffracting to a selected position, to direct light of a selected wavelength into a selected direction.

35. A method for fabricating a light modulator for modulating light from a source, said method comprising the steps of:

providing a substrate;

forming at least one diffraction grating on said substrate by forming a multiplicity of parallel grooves, said parallel grooves being spaced with a suitable pitch, while blazing said multiplicity of parallel grooves to diffract light of a selected diffraction order; and

forming a MEMS actuator disposed and adapted for establishing a desired spatial relationship between said diffraction grating and an output aperture spaced apart from said substrate, whereby light of at least one selected wavelength may be selectively directed though said output aperture.

36. A light modulator made by the method of claim 35.

37. A method for modulating the color of light from a source, said method comprising the steps of:

disposing a blazed grating to be illuminated by said light from said source and to diffract said light;

disposing a MEMS actuator for varying the spatial relationship between said blazed grating and an output aperture, said MEMS actuator being adapted to vary said spatial relationship in response to electrical signals; and

controlling said electrical signals to direct a selected wavelength of said diffracted light of a selected diffracted order through said output aperture.

38. The method of claim 37, wherein said MEMS actuator is adapted to tilt said blazed grating about an axis parallel to said blazed grating.

39. The method of claim 37, wherein said MEMS actuator is adapted to translate said output aperture in a plane.

40. The method of claim 39, wherein said plane is substantially parallel to said blazed grating.

41. The method of claim 37, wherein said MEMS actuator is adapted to translate said blazed grating in a plane.

42. The method of claim 41, wherein said plane is substantially parallel to said output aperture.